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Development of a generic wound care assessment minimum data set

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ABSTRACT

Background: At present there is no established national minimum data set (MDS) for generic wound assessment in England, which has led to a lack of standardisation and variable assessment criteria being used across the country. This hampers the quality and monitoring of wound healing progress and treatment.
Aim: To establish a generic wound assessment MDS to underpin clinical practice.
Method: The project comprised 1) a literature review to provide an overview of wound assessment best practice and identify potential assessment criteria for inclusion in the MDS and 2) a structured consensus study using an adapted Research and Development/University of California at Los Angeles Appropriateness method. This incorporated experts in the wound care field considering the evidence of a literature review and their experience to agree the assessment criteria to be included in the MDS.
Results: The literature review identified 24 papers that contained criteria which might be considered as part of generic wound assessment. From these papers 68 potential assessment items were identified and the expert group agreed that 37 (relating to general health information, baseline wound information, wound assessment parameters, wound symptoms and specialists) should be included in the MDS.
Discussion: Using a structured approach we have developed a generic wound assessment MDS to underpin wound assessment documentation and practice. It is anticipated that the MDS will facilitate a

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more consistent approach to generic wound assessment practice and support providers and commissioners of care to develop and re-focus services that promote improvements in wound care.

Abbreviations

MDS	Minimum Data Set
CQUIN	Commissioning for Quality and Innovation
NHS	National Health Service
ABPI	Ankle Brachial Pressure Index

1. Background

Chronic wounds, sometimes referred to as 'difficult to heal' wounds are usually defined in relation to wound duration with parameters of 4–12 weeks being used [1–4]. Chronic wounds, which commonly incorporate pressure ulcers, venous ulcers, arterial ulcers and diabetic ulcers represent a significant burden to patients and health care providers worldwide. It is estimated that almost 1% of the worlds population experiences difficult to heal wounds which are associated with negative quality of life [5]. In the United States, chronic wounds affect approximately 6.5 million patients with an estimated $25 billion treatment cost per annum [6]. This is also reflected in the United Kingdom where recent information from the Health Improvement Network (THIN) Database which collects data from primary care, indicated 4.5% (2.2 million) of the adult population were estimated to have a wound (excluding surgical wounds that healed within 4 weeks of the procedure) in 2012/13, accounting for 40.6 million healthcare professional/patient visits, 97.1 million drug prescriptions, 344.6 million dressings/bandages and costing £4.5–5.1 billion [7]. The study also found that 12% of wounds had no recorded diagnosis and 56% of the wounds recoded as leg ulcers lacked a differential diagnosis, suggesting a lack of evidence-based wound care/assessment [7]. This is a substantial problem to the NHS and an important part of nursing practice.

At present there is no established national minimum data set (MDS) for generic wound assessment, which has led to a lack of standardisation and variable criteria being used across England. This is particularly important for difficult to heal or chronic wounds as the lack of standardisation hampers decision making about diagnosis and treatment as well as the quality and monitoring of wound healing progress. Work to establish an MDS for generic wound assessment was taken forward as part of NHS England's Leading Change Adding Value Framework - Improving Wound Care Project. This aims to underpin wound assessment practice and to support commissioners and providers in developing and re-focussing services that promote improvements in wound care. The work is supported by a new quality indicator for improving the assessment of wounds as part of the 2017-19 Commissioning for Quality and Innovation (CQUIN) framework [8]. The Improving Wound Care Project is led by a Board (Fig. 1) which provides oversight for the development of the generic wound assessment MDS. The project incorporates:

1) A literature review to identify potential assessment criteria for the MDS and;
2) A structured consensus study to agree the assessment criteria to be included in the MDS to facilitate a standardised approach to wound assessment practice.

The Board is supported by a generic wound assessment MDS sub-group to provide focussed advice on this project, an 'expert by experience group' to provide the service-user and clinical user perspective and the consensus study expert group to agree the assessment criteria to be included in the MDS (Fig. 1).

2. Literature review

2.1. Method

A literature review was undertaken to identify potential assessment criteria to be included in the MDS. The review considered any literature relating to wound assessment criteria and was not limited by any particular study design and incorporated guidance papers [9]. A simple key word search (chronic wound, assessment, management, validity, reliability, guideline, documentation) of the MEDLINE database (Jan 1996–Aug 2016) was undertaken using Boolean operators 'and' 'or'. Citations of relevant studies were also considered.

The abstracts of these papers were screened to identify those which potentially provided comprehensive information about criteria considered when conducting wound assessment. Papers considered potentially relevant were reviewed in full by the researcher (SC). The wound assessment criteria contained in relevant papers were extracted and mapped against wound assessment domains (key assessment areas) and sub-domains (detailed assessment concepts). The initial framework for the domains and sub-domains were informed by the generic wound assessment MDS sub-group (Fig. 1). These were amended as new concepts emerged from the literature review and the final domains and sub-domains were reviewed and agreed by the Improving Wound Care project Board.

2.2. Results

The search identified over 300 papers, of which 24 identified wound assessment domains and sub-domains incorporating the following papers types:

- 9 wound healing/monitoring instruments [10–18].
- 10 wound assessment guidance [19–28].
- 2 primary wound care studies [29,30].
- 2 literature/systematic review [31,32]. The systematic review provided citations for other wound assessment instruments included in this review.
- 1 wound care quality improvement initiative [33].

Table 1 provides a summary of findings indicating 6 key domains comprising general health information wound history/baseline information, wound assessment parameters, wound symptoms, infection and specialist information and an associated 69 sub-domains. Most of these sub-domains were considered potential assessment criteria in the subsequent consensus study.

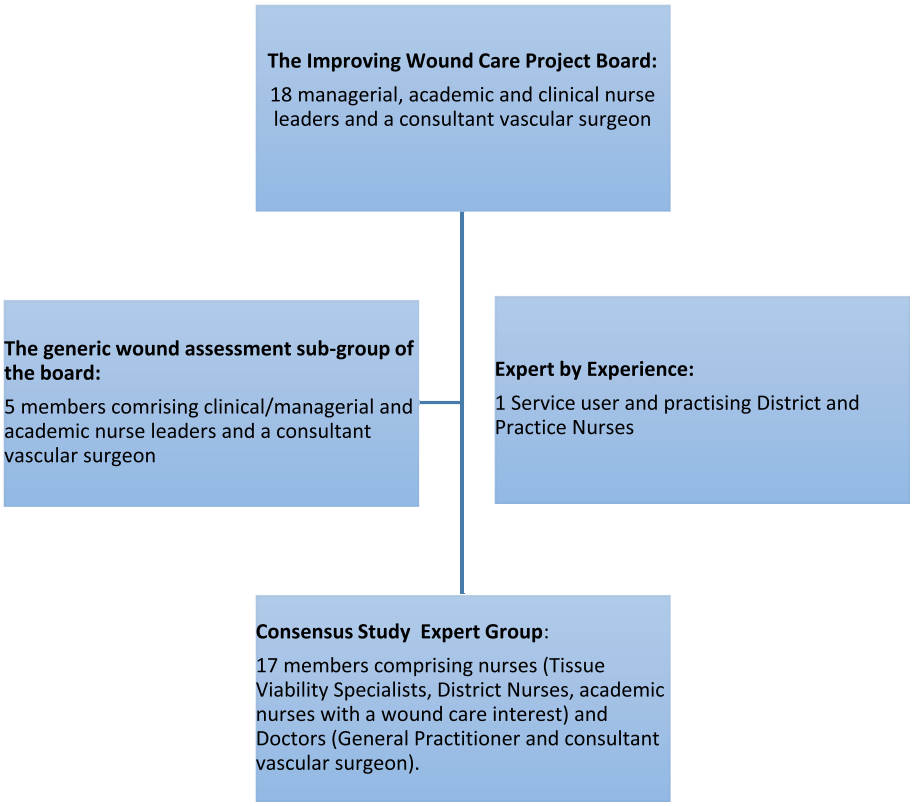

Fig. 1. Groups involved in the development of the Generic Wound Assessment MDS.

Further information for each paper can be found in Appendix 1.

3. Consensus study

3.1. Methods

A modified RAND/UCLA (Research and Development/University of California at Los Angeles) appropriateness method [34] based on a previous consensus study was used [35]. This incorporated face-to-face interaction of an expert group and pre- and post- meeting questionnaire completion (incorporating 9 point Likert scales) considering what should be included in a generic wound assessment MDS.

3.2. Sample

Participants forming the expert group were purposefully sampled to incorporate multi-speciality clinical/academic leaders in the wound care field, identified by their previous work and/or related publications [36]. Seventeen members were recruited to allow for attrition and to maximize reliability while preventing facilitation problems [37].

3.3. Ethical considerations

The study was reviewed and approved by a University of Leeds Research Ethics Committee. Prior to recruitment expert group members were provided with a study information sheet and encouraged to ask questions. Following this informed consent was sought by the researcher (SC).

3.4. Data collection

The initial literature review provided the framework for the pre and post meeting questionnaires which were developed to seek expert group members' individual views regarding the important elements to be included in the MDS. The questionnaires incorporated statements relating to potential assessment criteria and participants were asked to reflect on the results of the literature review and their clinical experience and/or expertise in the field when rating their level of support for including these in the MDS on a 9 point Likert scale (where 1 indicates poor support and 9 indicates strong support).

The questionnaires comprised fewer items than the sub-domains identified in literature review because the primary papers did not always specify the underlying concept being considered e.g. 'none specific exudate' sub-domain (did not specify whether this related to amount, consistency or something else). In contrast some sub-domains were excluded because they were considered too specific for the MDS and were only encountered in a few primary studies of the literature review, e.g. 'quality of life, social – hobbies'. Pre and post meeting questionnaire completion was undertaken to allow individuals to change their ratings in light of discussions and/or where necessary for questionnaire items to be clarified and amended.

The face-to-face meeting was undertaken in a pleasant hotel setting and refreshments were provided throughout. The meeting was facilitated by the researcher (SC) to ensure all members had the opportunity to discuss their opinions [37]. The focus of the meeting was discussing the scope of the MDS and reviewing the results of the pre-meeting questionnaire. This allowed areas of disagreement and uncertainty to be discussed and for members to consider this before privately re-rating their level of support in the post-meeting questionnaire.

Table 1
Wound assessment domains and sub-domains (potential assessment criteria) included in papers of the literature review.

Domain	Sub-domain	Of 24 papers
General health information	Allergies	3
	Mobility Status	2
	Risk Factors for Delayed Healing	
	Factors affecting systemic blood supply to wound (e.g. vascular or arterial disease, smoking, anaemia)	10
	Factors affecting local blood supply to wound (e.g. pressure/ shear, pressure ulcer)	8
	Factors affecting skin (e.g. malnutrition, obesity, peripheral neuropathy)	10
	Susceptibility to infection (e.g. immune-supressed)	10
	Medication affecting wound healing (e.g. steroids, chemotherapy)	9
	Generic delayed healing (non-specific)	2
	Quality of life	
	Patient Information	2
	Physical - Fatigue/lack of sleep	1
	Physical - Reduced mobility	2
	Physical- Health and wellbeing	2
	Physical - Changes to eating habits	1
	Physical- Daily activities	2
	Emotional – Depression	1
	Emotional – Emotions	2
	Social- Friendships	2
	Social – Hobbies	1
	Social - Frequency of dressing changes	1
	Social- Pain	1
	Social – Odour	1
	Social- Social isolation	2
	Non-specific	1
Wound history/baseline information	Number of wounds	6
	Wound Location	14
	Wound type/classification (e.g., venous leg ulcer, pressure ulcer)	16
	Wound Duration (e.g. weeks, months, years)	8
Wound assessment parameters	Wound size width	19
	Wound size length	19
	Wound size (non-specific)	1
	Wounds size depth	21
	Undermining/tunnelling	16
	Shape	3
	Wound bed tissue type (e.g. necrotic, sloughy)	20
	Wound bed tissue amount (e.g. percentage of wound)	11
	Wound bed (non- specific)	1
	Wound margins/edges description (e.g. epithelialisation undermining)	17
	Wound margins/edges (non-specific)	1
	Surrounding skin colour (e.g. redness)	17
	Surrounding skin condition (e.g. maceration, oedema, induration)	16
	Surrounding skin (non-specific)	2
	Current wound status (e.g. progress/deterioration)	12
Wound symptoms	Pain frequency (e.g. at dressing change)	11
	Pain severity	11
	Pain (non-specific)	4
	type (i.e. inflammatory neuropathic)	2
	Full pain assessment	5
	Current pain status (progress/change)	4
	Exudate amount (e.g. high, moderate)	18
	Exudate consistency/type/colour (e.g. serous, blood, sero-sanguineous, thick, thin)	16
	Exudate (non-specific)	1
	Current exudate status (progress/deterioration)	5
	Exudate problem to patient	1
	The performance of the current dressing in absorbing wound exudate	10
	Odour occurrence (e.g. on dressing removal, when dressing intact)	9
	Odour intensity (e.g. acceptable minimal, problem)	4
	Odour (non-specific)	2
	Current odour status (progress/changes)	5
	Odour problem to patient	1

(*continued on next page*)

Table 1 (*continued*)

Domain	Sub-domain	Of 24 papers
Infection	Signs of local wound infection (e.g. cellulitis, abscess/pus, increasing pain, exudate, odour; deterioration (wound breakdown and dehiscence), healing slower than anticipated, friable granulation tissue, bleeds easily, pocketing at wound base)	16
	Signs of systemic infection relating to the wound (e.g. high temp)	4
	Management of infection	6
Specialist Information	Tissue viability team referrals	0
	Hospital consultant referrals (e.g. vascular, plastics)	0
	Pressure ulcer risk assessment	8
	Doppler ABPI	5

3.5. Analysis

Questionnaire statements were summarised using the median group response and categorised into tertiles, 1–3 disagree, 4–6 uncertain, 7–9 agree. Within-group agreement was measured using the RAND Disagreement index [34], which considers the dispersion of individual scores and identifies areas of disagreement (where panellists rate at both ends of the Likert Scale). Using the group median response and the disagreement index for each statement the following principles were applied following post meeting questionnaire completion to identify MDS items:

- Group medians of 1–3 without disagreement will be excluded
- Group medians of 7–9 without disagreement will be included
- Disagreement index is >1 or median 4–6 will be excluded but are potential areas for further research

A directed content analysis approach [38] was used to code data from transcripts of the expert group meetings and a summary report was written and checked for accuracy the expert group.

3.6. Results

Expert group members comprised nurses and Doctors with a wound care interest (Fig. 1) and incorporated 2 males and 15 females. All seventeen members fully completed the pre-meeting questionnaire. Sixteen members attended the face-to-face meeting and fully completed the post-meeting questionnaire.

The expert group indicated their support for inclusion of 42 of the 46 MDS items (Table 2) included in the pre-meeting questionnaire (with one area of disagreement relating to odour status) and 4 areas of uncertainty (quality of life (physical, social and emotional) and pressure ulcer risk assessment).

The discussions at the face-to-face meeting (Table 3) led to some changes in opinion and amendments to the post-meeting questionnaire which incorporated 47 items. The amendments related to requested additional items of skin sensitivities, wound location, treatment aim, re-assessment date, pressure ulcer category, healing and some items being combined (all noted by italics in Table 2). The results of the post-meeting questionnaire indicated there was support for 33 items with a group median of 7–9 (without disagreement), lack of support for 7 items, uncertainty about 4 items, 1 item with a median of 8 but with disagreement, 2 items where the median fell in-between 2 tertiles.

Table 3 provides a summary of the specific assessment item and MDS implementation discussion points.

4. Further consultation

The Improving Wound Care Project Board (Fig. 1) met to discuss the results and drawing on the thematic summary (Table 3) it was agreed that an additional post-meeting follow-up questionnaire would be sent to the expert group to seek clarity on the item with a median of 3.5 (allergies), the item with a median of 8 with disagreement (signs of systemic infection) and an additional pain item. This led to the inclusion of these items (Table 2). In addition, the Board agreed that 'factors affecting the patient's skin integrity' should be recorded in the MDS. Table 4 provides a summary of the agreed generic wound assessment MDS comprising 37 items.

Further consultation about the MDS was also undertaken with the 'Expert by Experience' Group which was brought together to support the Improving Wound Care Project and comprised service users and practising District Nurses and Practice Nurses (Fig. 1). The group were supportive of the MDS and particularly about the inclusion of the quality of life item as they saw this as an opportunity for the patient to express the impact of the wound on their life and raise any issues that needed to be addressed as part of their treatment plan. The group also considered the use of photography to be a useful way of monitoring wound progress.

5. Discussion

This project comprising a literature review and a consensus study was undertaken to establish a generic wound assessment MDS. The literature review identified 6 key domains and 69 subdomains relating to wound assessment. This underpinned the development of consensus questionnaires comprising 46 (pre-meeting) and 47 (post-meeting) items that were considered by an expert group and led to the agreement of 37 items in the generic wound assessment MDS (Table 4).

In keeping with those who used structured consensus methods in the development of pressure ulcer risk assessment MDS [35], the method provided a transparent approach to the development of a generic wound assessment MDS, informed, in this case by a literature review (rather than a more robust systematic review) and the opinions of experts in the field. The discussions of the expert group face-to-face meeting allowed challenges and differences in opinion to be explored and understood. This highlighted the different approaches to wound assessment and the complexities of standardising this variation across different systems for patient records including paper-based, electronic and various combinations of the two. Avoiding duplication between the MDS and the standard holistic patient assessment was recognised as a challenge given the differing approaches being used. This led to some flexibility where it was agreed that some items should be recorded in the MDS if not recorded in wider the patient record e.g. allergies, quality of life. Another important discussion point of the expert group and expert by experience group related to the use of photography for wound assessment and monitoring purposes. Due to recognition of the varying availability of high quality cameras in clinical practice, the

Table 2
Questionnaire results.

Pre-Meeting Potential Assessment Criteria	GM	DI	Post-Meeting Potential Assessment Criteria	GM	DI
Allergies should be recorded in the generic wound assessment MDS.	9.00	0.75	Allergies should be recorded in the generic wound assessment MDS.	3.50*	2.26
			Skin sensitivities should be recorded in the generic wound assessment MDS.	9.00	0.00
Mobility status should be recorded in the generic wound assessment MDS.	7.00	0.75	Mobility status should be recorded in the generic wound assessment MDS.	2.00	0.65
Factors affecting the patient's systemic blood supply to wound (e.g. vascular or arterial disease, smoking anaemia) should be recorded in the generic wound assessment MDS.	9.00	0.05	Factors affecting the patient's systemic blood supply to wound (including vascular or arterial disease, smoking anaemia) should be recorded in the generic wound assessment MDS.	7.00	0.61
Factors affecting the patient's local blood supply to the wound (e.g. pressure/shear, pressure ulcer) should be recorded in the generic wound assessment MDS.	9.00	0.13	Factors affecting the patient's local blood supply to the wound (including pressure/shear, pressure ulcer) should be recorded in the generic wound assessment MDS.	7.00	0.70
Factors affecting the patient's skin integrity (e.g. malnutrition, obesity, peripheral neuropathy) should be recorded in the generic wound assessment MDS.	9.00	0.29	Factors affecting the patient's skin integrity (including malnutrition, obesity, peripheral neuropathy) should be recorded in the generic wound assessment MDS.	6.50*	0.78
Factor affecting the patient's susceptibility to infection (e.g. immune-supressed) should be recorded in the generic wound assessment MDS.	8.00	0.33	Factor affecting the patient's susceptibility to infection (including immune-supressed) should be recorded in the generic wound assessment MDS.	7.50	0.49
Medication affecting wound healing (e.g. steroids, chemotherapy) should be recorded in the generic wound assessment MDS.	9.00	0.16	Medication affecting wound healing (including steroids, chemotherapy) should be recorded in the generic wound assessment MDS.	7.00	0.52
The number of wounds should be recorded in the generic wound assessment MDS.	9.00	0.00	The number of wounds should be recorded in the generic wound assessment MDS.	9.00	0.00
			The location of the wound should be recorded in the generic wound assessment MDS.	9.00	0.00
The wound type/classification (e.g., venous leg ulcer, pressure ulcer) should be recorded in the generic wound assessment MDS.	9.00	0.00	The wound type/classification (including, venous leg ulcer, pressure ulcer) should be recorded in the generic wound assessment MDS.	9.00	0.00
The duration of the wound (e.g. weeks, months, years) should be recorded in the generic wound assessment MDS.	9.00	0.00	The duration of the wound (including weeks, months, years) should be recorded in the generic wound assessment MDS.	9.00	0.00
			The treatment aim should be recorded in the generic wound assessment MDS.	9.00	0.29
			A planned re-assessment date should be recorded in the generic wound assessment MDS.	9.00	0.00
The width of the wound should be recorded in the generic wound assessment MDS.	9.00	0.00	The *maximum* width of the wound should be recorded in the generic wound assessment MDS.	9.00	0.00
The length of the wound should be recorded in the generic wound assessment MDS.	9.00	0.00	The *maximum* length of the wound should be recorded in the generic wound assessment MDS.	9.00	0.00
The depth of the wound should be recorded in the generic wound assessment MDS.	9.00	0.02	The *maximum* depth of the wound should be recorded in the generic wound assessment MDS.	9.00	0.00
			The category of a pressure ulcer wound should be recorded in the generic wound assessment MDS.	9.00	0.00
Undermining/tunnelling of the wound should be recorded in the generic wound assessment MDS.	9.00	0.00	Undermining/tunnelling of the wound should be recorded in the generic wound assessment MDS.	9.00	0.00
The shape of the wound should be recorded in the generic wound assessment MDS.	7.00	0.75	The shape of the wound should be recorded in the generic wound assessment MDS.	1.00	0.21
The wound bed tissue type (e.g. necrotic, sloughy) should be recorded in the generic wound assessment MDS.	9.00	0.00	The wound bed tissue type *after cleansing* (including necrotic, sloughy, *granulating, epithelialisation, tendon, bone*) should be recorded in the generic wound assessment MDS.	9.00	0.00
The wound bed tissue amount (e.g. percentage of wound) should be recorded in the generic wound assessment MDS.	9.00	0.54	The wound bed tissue amount *after cleansing* should be *quantified and* recorded in the generic wound assessment MDS.	9.00	0.00
A description of the wound margins/edges (e.g. epithelialisation, undermined) should be recorded in the generic wound assessment MDS.	9.00	0.05	A description of the wound margins/edges (including epithelialisation, undermined) should be recorded in the generic wound assessment MDS.	9.00	0.13
The colour of the skin surrounding the wound (e.g. redness) should be recorded in the generic wound assessment MDS.	9.00	0.02	The colour *(including redness) and condition (including oedema, maceration, induration* of the skin surrounding the wound should be recorded in the generic wound assessment MDS.	9.00	0.00

Pre-Meeting Potential Assessment Criteria	GM	DI	Post-Meeting Potential Assessment Criteria	GM	DI
The condition of the skin surrounding the wound (e.g. oedema, maceration, induration) should be recorded in the generic wound assessment MDS.	9.00	0.00			
The current overall wound status (e.g. improving, deteriorating) should be recorded in the generic wound assessment MDS.	9.00	0.29	The current overall wound status (including improving, deteriorating) should be recorded in the generic wound assessment MDS.	2.50	0.37
			Whether the wound has healed should be recorded in the generic wound assessment MDS.	9.00	0.00
Pain frequency (e.g. constant, at dressing change) should be recorded in the generic wound assessment MDS.	9.00	0.13	Wound pain frequency (including constant, at dressing change) should be recorded in the generic wound assessment MDS.	9.00	0.13
Pain severity (e.g. on a visual analogue scale) should be recorded in the generic wound assessment MDS.	8.00	0.13	Wound pain severity (including on a visual analogue scale) should be recorded in the generic wound assessment MDS.	8.00	0.13
The type of pain (i.e. inflammatory or neuropathic) should be recorded in the generic wound assessment MDS.	7.00	0.75	The type of *wound* pain (i.e. inflammatory or neuropathic) should be recorded in the generic wound assessment MDS.	6.00	1.94
A full validated pain assessment instrument should be used and recorded in the generic wound assessment MDS.	7.00	0.75	A full validated *wound* pain assessment instrument should be used and recorded in the generic wound assessment MDS.	5.00	1.61
The current pain status (e.g. improving, deteriorating, changes) should be recorded in the generic wound assessment MDS.	7.00	0.54	The current pain status (including improving, deteriorating, changes) should be recorded in the generic wound assessment MDS.	3.00	0.83
The exudate amount (e.g. high, moderate) should be recorded in the generic wound assessment MDS.	9.00	0.02	The exudate amount (including high, moderate) should be recorded in the generic wound assessment MDS.	9.00	0.00
Exudate consistency/type/colour (e.g. serous, blood, sero-sanguineous, thick, thin) should be recorded in the generic wound assessment MDS.	8.00	0.16	Exudate consistency/type/colour (including serous, blood, sero-sanguineous, thick, thin) should be recorded in the generic wound assessment MDS.	9.00	0.00
The current exudate status (e.g. static, reducing, increasing) should be recorded in the generic wound assessment MDS.	8.00	0.37	The current exudate status (including static, reducing, increasing) should be recorded in the generic wound assessment MDS.	2.00	0.50
The performance of the current dressing in absorbing wound exudate (e.g. strikethrough, leakage) should be recorded in the generic wound assessment MDS.	8.00	0.33	The performance of the current dressing in absorbing wound exudate (including strikethrough, leakage) should be recorded in the generic wound assessment MDS.	5.50	2.13
Whether exudate is a problem to the patient should be recorded in the generic wound assessment MDS.	9.00	0.29	Whether exudate is a problem to the patient should be recorded in the generic wound assessment MDS.	2.50	1.29
The occurrence of odour (e.g. on dressing removal, when dressing intact) should be recorded in the generic wound assessment MDS.	9.00	0.33	The occurrence of odour (including on dressing removal, when dressing intact) should be recorded in the generic wound assessment MDS. (b and c deleted as felt already covered in a and d)	8.50	0.13
The intensity of odour (e.g. acceptable, minimal, problem) should be recorded in the generic wound assessment MDS.	8.00	0.67			
The current odour status (e.g. changes) should be recorded in the generic wound assessment MDS.	7.00	1.14			
Whether odour is a problem to the patient should be recorded in the generic wound assessment MDS.	9.00	0.13	Whether odour is a problem to the patient should be recorded in the generic wound assessment MDS.	5.00	2.55
Signs of local wound infection (e.g. cellulitis, abscess/pus, increasing pain, exudate, odour; deterioration (wound breakdown and dehiscence), healing slower than anticipated, friable granulation tissue, bleeds easily, pocketing at wound base) should be recorded in the generic wound assessment MDS.	9.00	0.00	Signs of local wound infection (including cellulitis, abscess/pus, increasing pain, exudate, odour; deterioration (wound breakdown and dehiscence), healing slower than anticipated, friable granulation tissue, bleeds easily, pocketing at wound base) should be recorded in the generic wound assessment MDS.	9.00	0.00
Signs of systemic infection (e.g. high temperature) relating to the wound should be recorded in the generic wound assessment MDS.	9.00	0.37	Signs of systemic infection (including high temperature) relating to the wound should be recorded in the generic wound assessment MDS.	8.00	1.30
The management of infection should be recorded in the generic wound assessment MDS.	9.00	0.29	*Whether a wound swab has been taken* should be recorded in the generic wound assessment MDS. (replaces the management of wound infection)	9.00	0.06
Referrals to the Tissue Viability Nurse/Team should be recorded in the generic wound assessment MDS.	9.00	0.13	Referrals to the Tissue Viability Nurse/Team should be recorded in the generic wound assessment MDS.	8.50	0.29
Referrals to a hospital consultant (e.g. vascular, plastics) should be recorded in the generic wound assessment MDS.	9.00	0.13	Referrals to a hospital consultant (including vascular, plastics) should be recorded in the generic wound assessment MDS.	8.50	0.29
Information provided to patients and carers should be recorded in the generic wound assessment MDS.	7.00	0.54	Information provided to patients and carers should be recorded in the generic wound assessment MDS.	7.50	0.75

Pre-Meeting Potential Assessment Criteria	GM	DI	Post-Meeting Potential Assessment Criteria	GM	DI
The impact of the wound on the physical aspects of the patients quality of life (e.g. fatigue/lack of sleep, activities of daily living, mobility, altered eating habits) should be recorded in the generic wound assessment MDS.	6.00	0.65	The impact of the wound on the physical, *emotional and social* aspects of the patient's quality of life should be recorded in the generic wound assessment *MDS if it is not included in the patients generic record*.	8.50	0.13
The impact of the wound on the emotional aspects of the patients quality of life (e.g. emotions, depression) should be recorded in the generic wound assessment MDS.	6.00	0.65			
The impact of the wound on the social aspects of the patients quality of life (e.g. hobbies, friendships, social isolation, pain, odour) should be recorded in the generic wound assessment MDS.	6.00	0.65			
A pressure ulcer risk assessment should be recorded in the generic wound assessment MDS.	5.00	0.72	A pressure ulcer risk assessment should be recorded in the generic wound assessment MDS.	1.50	0.21
Specialist investigations (e.g. ABPI, Doppler) should be recorded for chronic wounds of the lower limb and recorded in the generic wound assessment MDS.	9.00	0.33	Specialist investigations (including ABPI, Doppler) should be recorded for chronic wounds of the lower limb and recorded in the generic wound assessment MDS.	8.00	0.13
			Additional post-meeting questionnaire items		
			Allergies should be recorded in the generic wound assessment MDS if it is not included in the patients generic record.	9.00	0.13
			Signs of systemic infection (including high temperature) relating to the wound should be recorded in the generic wound assessment MDS if it is not included in the patients generic record.	9.00	0.13
			An initial item about whether the patient experiences wound pain should be recorded in the generic wound assessment MDS.	9.00	0.13

Group Medians (GM): This gives an indication of whether there it support for the questionnaire item (no background indicates good support for inclusion (7-9), light gray indicates uncertainty (4-6), dark gray indicates poor support (1-3)). Disagreement Index (DI): this gives an indication of whether expert members agreed with each other indexes above 1 indicate there is disagreement within the group (indicated by dark gray background). *indicates the median falls between 2 tertiles.

use of photography was not included in the MDS. However, it was recognised as good practice, something which should be encouraged and could potentially be included in the MDS in the future.

The MDS was developed using a bottom-up manner involving predominantly clinical practitioners with facilitation by policy makers (NHS England) and academia. This approach enabled academic scientific theoretical knowledge to be balanced with technical knowledge and practical wisdom from clinical practice to inform the MDS. The resulting MDS is therefore more likely to be acceptable and usable in clinical practice. The decision to focus on a MDS rather than seeking to develop a pre-specified assessment form also allows flexibility. Many healthcare providers will already use a wound assessment form that incorporate many or all of the items in the MDS. The MDS will allow review of existing documentation systems against a set of evidence-based criteria to assess whether supplementation or simplification is required.

The development of the MDS has sought to address concerns over inadequate wound assessment practice [7] by providing a framework upon which healthcare provider organisations can base their assessment documentation. However, the MDS can only provide a starting point for improving care and measures to encourage implementation are needed. The MDS will be supported by a guidance manual for practice, sample assessment forms and a specific CQUIN to monitor progress. It is anticipated that the MDS will facilitate a more consistent approach to wound assessment potentially leading to improved subsequent t clinical decision making about wound care treatment, escalation plans, pathways and patient outcomes. The MDS may lead to the development of large NHS data-sets that can be used for research and to monitor wound care practice and service improvements. It could provide a more consistent approach to the recording characteristics of future wound care studies [39], facilitating the possibility combining the results of different studies and meta −analysis to provide a more robust evidence-base in the field.

The development of the MDS is only one important component of the Improving Wound Care Project and other work streams including React to Red, Education & Competencies and Wound Care Commissioning Support (Primary Care & Community Services) all have a role to play in supporting improvements in wound care practice. Of particular note is the need for further development of more specialist assessment MDS for specific types of wounds such as those of the lower limb.

5.1. Limitations

The literature review was undertaken by one reviewer and only incorporated the search of one database over limited years, with the potential that a more systematic scoping review may have identified additional relevant studies. However, given that the literature review aimed to identify potential items for inclusion in the MDS (rather than identifying every paper that considered wound assessment parameters) and we drew on the collective wisdom of experts in the wound care field throughout the consensus process, it seems unlikely that any important aspects of wound assessment would have been missed.

Another area of concern relates to limited service user involvement in this study. While other consensus studies have incorporated limited numbers of patients/carers in their expert groups [40,41], we used a different approach in an effort to avoid under-representation of service user views [35] and some of the problems associated with reviewing complex information and facilitating mixed groups of professionals and patients [42]. This

Table 3
Summary of discussions.

Potential Assessment Criteria	Summary of Discussion
Allergies	-Acknowledged as an important consideration but debate about duplication -Concern from a medico-legal perspective and that it should be included. -Concern that nurses focus on generic allergies to medications rather than wound care specific allergies (e.g. dressings, emollients, tapes).
Sensitivities	-Concern that while many patients may not be technically allergic to a particular product or dressing the may have sensitivities (e.g. they may complain of itchiness or redness) which should be considered.
Risk Factors for delayed healing	-Duplication concerns but considered important in the wound care context to inform treatment. -Concern that lack of education, knowledge and research in this area could make it difficult for nurses to make the link between delayed healing risk factors and wound assessment and that prompts to facilitate this were needed. -Suggested that risk factors for delayed healing should be broken down to systemic and local blood supply to the wound, skin integrity, susceptibility to infection and medication to prompt their consideration
Quality of Life (QOL)	-Duplication concerns but the need to ensure patient centeredness was emphasised. -Noted that in patients with multiple co-morbidities it was sometimes difficult to separate wound-specific QOL issues from wider illnesses.
Number of wounds	-Acknowledged as important but in practice a separate wound assessment form would be used for each wound.
Wound type/classification	-Recognised as being particularly important in informing appropriate treatment.
Wound Location	-Important in informing the wound type (e.g. lower limb wounds may prompt the nurse to consider the possibility of a leg ulcer).
Wound duration	-Acknowledged as important in informing ongoing treatment and referrals. -The date of first wounding was considered important for continuity and preventing 'everybody starting at the beginning again' and failing to recognised the long-standing nature of a particular wound. -The duration of the wound can be calculated from date of first wounding. -Digital health records may allow automated flagging of non-healing wounds after specific time periods to prompt further action.
Treatment aim	-Acknowledged as important as some wounds are unlikely to heal.
Reassessment	-A date to prompt reassessment was considered important.
Referrals	-Considered important in demonstrating pathway compliance e.g. referral to specialist if non-healing after to specific time period.
Wound size	-Length, width and depth of a wound considered of paramount importance in being able monitor improvement, deterioration and failure of wounds to heal. -The need for consistent and accurate wound measurement undertaken at the maximum part of the wound for each parameter was highlighted. -The method used for wound measurement and body maps was a matter for local policy. -Overall the shape of the wound was not considered to be important to be included in the MDS as the other measurements were considered sufficient. -The category of pressure ulcers should be noted.
Wound Bed Tissue Type	-Recognised as providing an assessment of the healing continuum and as providing the basis for treatment decisions. -Prompts would be needed to describe the wound bed (necrotic, sloughy, granulating, epithelialisation, tendon, bone) -This could be simplified by using colour descriptors of the wound bed. -High quality photography should be encouraged but could not replace existing assessment parameters.
Wound Bed Tissue amount	-Tissue amount (as well as type) was considered important as it may prompt further actions i.e. if a wound changed from having a little slough to being fully sloughy then a change in care would be needed. -Overall the group leaned towards the use of percentage measurement for quantifying tissue amount but noted the need for education and guidance.
Description of wound margins	-Considered important in the ongoing monitoring of the wound particularly relating to the colour and condition of the surrounding skin.
Current overall wound status and healing	-Concern was raised about the subjectivity of the overall wound status item. -Other wound assessment items provide more objective measures of improvement/deterioration. -Need to record whether a wound had healed as a key outcome.
Pain	-Suggested that one leading item was needed about whether they had wound pain or not, which could lead to other items i.e. frequency and severity. -Acknowledged that some areas use specific pain care plans with metrics and there was concern about duplication for some pain items. -It was also noted that we needed to make it clear that the assessment related to 'wound pain' rather than other pain.
Exudate	-Overall the 'exudate amount' item was considered to provide an objective measure of wound response (which would be informed by dressing performance). -The item relating to whether exudate was a problem to the patient was considered redundant as exudate was always an issue and is addressed in the other items. -The current exudate item was not considered an objective measure.
Odour	-Recognised odour as a very important symptom, particularly relating to a sign of infection (especially in the presence of increasing exudate and pain), -Also acknowledged as being very subjective measure with a lack of a reliable tool to assist with odour measurement in practice. -Patient (or carer/family) concerns were the most important consideration. - Suggested that only the presence of odour item was needed in the MDS.
Referrals	- Considered important in demonstrating pathway compliance e.g. referral to specialist if non-healing after to specific time period.
Pressure Ulcer Risk Assessment	- Concern about duplication - Thought to be more relevant to the holistic patient assessment as undertaken on all patient to facilitate prevention.

Table 3 (*continued*)

Potential Assessment Criteria	Summary of Discussion
Specialists	- Generic assessment should prompt consideration of a Doppler for wounds on the lower limb (when appropriate), to facilitate a diagnosis and guide subsequent treatment/referral pathways. - The appropriateness of undertaking a Doppler should be informed by the holistic assessment of the patient. - The inclusion of a Doppler could be usefully included to prompt a second tier more specialised assessment of the lower limb.
MDS Scope and Implementation Issues	- Acknowledged that the MDS would be supported by appropriate clinical policies. - Concerns about duplication between information in the standard holistic patient assessment and MDS. - Recognised that those with electronic records may be able to pull through information of relevance to the wound assessment from the wider patient assessment. - Acknowledged that there is great variation in the implementation of electronic records and that the MDS would need to work for both electronic and paper-based systems. - Envisaged that the MDS should facilitate clinical decision making and raise early warning of potential wound healing problems.

Table 4
Generic wound assessment minimum data set.

Domains	Core Generic Wound Assessment Minimum Data Set
General Health Information	- Risk factors for delayed healing (systemic and local blood supply to the wound, susceptibility to infection, medication affecting wound healing, skin integrity) - [a]Allergies - Skin sensitivities - [a]Impact of the wound on quality of life (physical, social & emotional) - Information provided to patient and carers
Wound Baseline Information	- Number of wounds - Wound location - Wound type/classification - Wound duration - Treatment aim - Planned re-assessment date
Wound Assessment Parameters	- Wound size (maximum length, width and depth) - Undermining/tunnelling - Category (pressure ulcers only) - Wound bed tissue type - Wound bed tissue amount - Description of wound margins/edges - Colour and condition of surrounding skin - Whether the wound has healed
Wound Symptoms	- Presence of wound pain - Wound pain frequency - Wound pain severity - Exudate amount - Exudate consistency/type/colour - Odour occurrence - [a]Signs of systemic infection - Signs of local wound infection - Whether a wound swab has been taken
Specialists	- Investigation for lower limb (ABPI) - Referrals (TVT, Hospital Consultants)

[a] Should be recorded in generic wound assessment MDS if not recorded in wider the patient record.

involved consultation with the 'expert by experience group' following the consensus process. Unfortunately despite best efforts, there were difficulties in identifying patients/carers who were able to join the group and only one service user representative was involved. Increased numbers of service users may have identified additional important issues to influence the final MDS. In addition, it could be argued that the involvement of patients and carers earlier in the consensus process would have facilitated increased integration of their views to shape the MDS. Involving patients in research of cross–speciality problems has been identified as challenging due to lack of support infrastructure and the complex health needs of potential participants [42]. The Wound Care Project Board are committed to increasing service user involvement through a range of methods in the wider programme of work.

6. Conclusion

Using structured consensus methods that incorporated a literature review and expert opinion we have developed an MDS to underpin wound assessment documentation and practice. It is anticipated that the MDS will facilitate a more consistent approach to generic wound assessment practice and support providers and commissioners of care to develop and re focus services that promote improvements in wound care with the potential for improved patient outcomes. Future research is needed to confirm this.

Appendix 1. Detailed Wound assessment sub-domains included in papers of literature review

Domain	Sub-domain	Barber 2008	Bates-Jensen 1997	Beitz& Rijswijk 2010	Brown 2006	Collier 2003	Cullum et al 2016	Doughty 2004	Ferrell 1997	Grey et al 2006	Hess 2005	Jones et al 2006	Keast et al 2004	Krasner 1997	Lait & Smith 1997	NPUAP 1998	Morrison et al 2004	Porkorna & Leaper 2014	Restrepo-Medrano & Soriano 2010	Stewart et al 2009	Schultz et al 2003	Stotts & Sparacino 2005	Sussman & Swanson 1997	Woodbury et al 2004	Total
General health information	Allergies									1							1					1			3
	Mobility Status																1					1			2
Risk Factors for Delayed Healing	Factors affecting blood supply to wound (e.g. vascular or arterial disease, smoking anaemia)				1	1	1	1		1	1				1		1				1	1			10
	Factors affecting local blood supply to wound (e.g. pressure/shear, pressure ulcer)				1		1	1		1		1			1		1			1	1	1			8
	Factors affecting skin (e.g. Malnutrition, Obesity, peripheral neuropathy)				1	1	1	1		1	1				1		1			1	1	1			10
	Susceptibility to infection (e.g. immune-supressed)				1	1	1	1		1	1				1		1			1	1	1			10
	Medication affecting wound healing (e.g. steroids, chemotherapy)				1	1	1	1		1	1				1		1			1	1	1			9
	Generic delayed healing (non-specific)			1										1				1							2
Wound history/ baseline information	Number of wounds			1	1	1	1				1						1	1		1					6
	Wound Location			1	1	1	1	1		1	1	1				1	1	1		1		1			14
	Wound type/classification (e,g, venous leg ulcer, pressure ulcer)			1	1	1	1	1	1	1	1	1			1	1	1			1	1		1		16
	Wound Duration (e.g. weeks, months, years)	1				1					1						1	1	1	1	1				8
Wound Assessment	Wound size width	1	1		1	1	1			1	1	1	1		1	1	1	1	1	1	1	1	1		19

Domain	Sub-domain	Barber 2008	Bates-Jensen 1997	Beitz& Rijswijk 2010	Brown 2006	Collier 2003	Cullum et al 2016	Doughty 2004	Ferrell 1997	Grey et al 2006	Hess 2005	Jones et al 2006	Keast et al 2004	Krasner 1997	Lait & Smith 1997	NPUAP 1998	Morrison et al 2004	Porkorna & Leaper 2014	Restreppo-Medrano & Soriano 2010	Stewart et al 2009	Schultz et al 2003	Stotts & Sparacino 2005	Sussman & Swanson 1997	Woodbury et al 2004	Total
	Wound size length	1	1		1	1	1			1	1	1	1		1	1	1	1	1	1	1	1	1	1	19
	Wound size (non-specific)			1																					1
	Wounds size depth	1	1	1	1	1	1	1		1	1	1	1	1	1		1	1	1	1	1	1	1	1	21
	Undermining/tunnelling	1	1	1	1			1		1	1	1	1				1	1	1	1		1	1	1	16
	Shape		1														1					1			3
	Wound Bed tissue type (e.g necrotic, sloughy)		1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	20
	Wound Bed tissue amount (e.g. percentage of wound)		1	1	1		1			1	1	1	1				1					1		1	11
	Wound bed (non-specific)																			1					1
	Wound margins/edges description (e.g. epithelialisation unattached)		1		1			1	1	1	1	1	1	1			1	1	1	1	1	1	1	1	17
	Wound margins/edges (non-specific)			1																					1
	Surrounding skin colour (e.g. redness)		1		1	1	1		1	1	1	1	1				1	1	1	1	1	1	1	1	17
	Surrounding skin condition (e.g. maceration, oedema, induration)		1		1	1	1		1	1	1	1	1				1		1	1	1	1	1	1	16
	Surrounding skin (non-specific)			1				1																	2
	Current Wound Status (e.g. progress/deterioration)				1	1	1					1	1	1	1	1			1			1	1	1	12
Wound symptoms	Pain Frequency (e.g. at dressing change)				1	1	1			1	1		1				1	1	1		1			1	11
	Pain Severity				1	1	1			1	1		1				1	1	1		1			1	11
	Pain (non-specific)			1								1			1							1			4
	type (i.e. inflammatory neuropathic)									1			1												2
	Full pain assessment					1	1			1	1		1												5
	Current pain status (progress/change)						1											1	1		1				4

Domain	Sub-domain	Barber 2008	Bates-Jensen 1997	Beitz& Rijswijk 2010	Brown 2006	Collier 2003	Cullum et al 2016	Doughty 2004	Ferrell 1997	Grey et al 2006	Hess 2005	Jones et al 2006	Keast et al 2004	Krasner 1997	Lait & Smith 1997	NPUAP 1998	Morrison et al 2004	Porkorna & Leaper 2014	Restrepo-Medrano & Soriano 2010	Stewart et al 2009	Schultz et al 2003	Stotts & Spracino 2005	Sussman & Swanson 1997	Woodbury et al 2004	Total
	Exudate amount (e.g. high, moderate)		1	1	1		1	1		1	1	1	1			1	1	1	1	1	1	1		1	18
	Exudate consistency/type/colour (e.g. serous, blood, sero-sanguineous, thick, thin)		1		1	1	1		1		1	1	1				1	1	1	1	1	1		1	16
	Exudate (non-specific)														1										1
	Current exudate status (progress/deterioration)						1						1				1	1				1			5
	Exudate problem to patient									1															1
	The performance of the current dressing in absorbing wound exudate		1		1					1		1	1			1	1	1			1			1	10
	Odour occurrence (e.g. on dressing removal, when dressing intact)			1			1		1		1		1				1	1			1	1			9
	Odour intensity (e.g. acceptable minimal, problem)								1		1		1			1									4
	Odour (non-specific)											1			1										2
	Current odour status (progress/ changes)						1						1					1			1	1			5
	Odour problem to patient									1															1
Infection	Signs of local wound infection (e.g. cellulitis; Abscess/pus; Increasing pain, exudate, odour; deterioration (wound breakdown and dehiscence); healing slower than anticipated; friable granulation tissue; bleeds easily pocketing at wound base)			1	1		1	1	1	1	1	1	1	1	1		1	1			1	1		1	16
	Signs of systemic infection relating to the wound (e.g. high temp)												1								1	1		1	4

Domain	Sub-domain	Barber 2008	Bates-Jensen 1997	Beitz& Rijswijk 2010	Brown 2006	Collier 2003	Cullum et al 2016	Doughty 2004	Ferrell 1997	Grey et al 2006	Hess 2005	Jones et al 2006	Keast et al 2004	Krasner 1997	Lait & Smith 1997	NPUAP 1998	Morrison et al 2004	Porkorna & Leaper 2014	Restrepo-Medrano & Soriano 2010	Stewart et al 2009	Schultz et al 2003	Stotts & Sparacino 2005	Sussman & Swanson 1997	Woodbury et al 2004	Total
	Management of infection					1				1	1	1									1	1			6
Referrals	Specialist Referrals																								0
Quality of Life	Patient information					1									1										2
	Physical - frequency of dressing changes									1															1
	Physical - fatigue/lack of sleep									1															1
	Social - pain									1															1
	Social- odour									1															1
	Physical - reduced mobility									1							1								2
	Physical - health and wellbeing									1							1								2
	Physical - altered eating habits									1															1
	Social - social isolation									1							1								2
	Emotional- depression									1															1
	Emotional - emotions									1							1								2
	Physical - daily activities									1							1								2
	Social - friendships									1		1					1								2
	Social - hobbies									1															1
	Non-specific																							1	1
Pressure Ulcer specific Elements of Assessment	Pressure ulcer risk assessment										1	1					1			1	1		1		8
Lower Limb (i.e. leg, foot or toe) specific investigations	Doppler ABPI				1	1	1				1										1				5

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